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NEW LATERAL STABILIZING DEVICE FOR AIRPLANES.

By Louis Constantin.

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The proposed device tends to render the lateral stabilization of airplanes easier and more efficacious. The now almost universal method of lateral stabilization by ailerons presents the following disadvantages.

The muscular force required to operate them on large airplanes is considerable. The efficacy of this method is very small when, for any reason, the airplane is flying at large angles of attack. In this case, any variation in the incidence of the ailerons produces only a very feeble corresponding increase in the lift, when the increase in the drag is very great and when this increase may even change direction and become a decrease, with disastrous consequences. Lastly, when an airplane is turning, the increase in drag is on the outside of the curve, contrary to all logic.

In order to remedy the first of these disadvantages, it was thought to make the ailerons entirely independent of the wings and capable of turning about an axis located parallel to the leading edge under the action of lateral stabilizing controls and at the will of the pilot. The latter device has not been adopted, however, because the first two disadvantages still persist.

We propose, on the one hand, to mount these ailerons independently, in such manner that they can turn freely, under the action of the relative wind, about an axis located in front of

* From "Premier Congres International de la Navigation Aerienne, Paris, November, 1921, Vol. IV, pp. 504-6.

the extreme position of the center of lift. They will behave like wind vanes and assume, in the direction of the wind, such a position that their angle of attack will be about 0°, without regard to the angle of attack of the wings.

On the other hand, by means of a suitable mechanical device, leaving to the ailerons all their liberty of rotation during normal flight and preferably comprising only a single maneuver, we propose to bring them into action only at the desired moment, so that they will always be, without regard to the position of the wings, under the most favorable conditions for effectiveness, without the pilot's needing to execute any more complex maneuver than with existing devices.

The advantages are very evident. In the first place, the judicious disposition of the axis of rotation will render it possible to reduce to a minimum the muscular force required and the aileron can be balanced without the usual disadvantages. In the second place, the aileron will always have the maximum efficacy compatible with its area and cross-section. In the third place, the cross-section may be so chosen that, starting from the position of equilibrium, the drag of the aileron on the inside of the curve will increase and that of the aileron on the outside of the curve will decrease. The wing without ailerons will be stronger and aerodynamically more efficient.

Such a device is shown diagrammatically by Figs. 1, 2 and 3. The independent aileron A, which can rotate freely about the axis O, is in equilibrium under the influence of the relative

wind V. This aileron is connected, by means of a cable C running around a small pulley p, to the large pulley P controlled by the cog-wheel R. A toothed sector S can engage with the cog-wheel. This sector is fixed on a part K which can oscillate from right to left about the axis a under the action of the vertical control lever M, which can itself oscillate forward and backward, about the axis b, for the purpose of controlling the elevator.

Under these conditions, it is clear that, whatever may be the position of the control lever from the elevator point of view, the aileron A will remain free, so long as the pilot does not incline this control lever toward the left or right. Then, and then only, the aileron A will be controlled and will assume a larger angle of attack. It will therefore always be under the best conditions for effective action.

It is easy to imagine a method of control capable of operating both ailerons simultaneously in opposite directions, the same as when they are connected.

An objection, which may well be made to the proposed device, is that such ailerons do not assist in sustentation. In the cases when, as the result of particular conditions for computing the airplane, this would be especially troublesome, it would be easy, by judiciously locating the center of gravity of the aileron behind the axis of rotation, to obtain an initial position of equilibrium corresponding, e.g. to an angle of 3° or 4°. It is evident that, under these conditions, the aileron

would assist in the sustentation, while losing only a very small part of the advantages enumerated above.

Translated by the National Advisory Committee for Aeronautics.

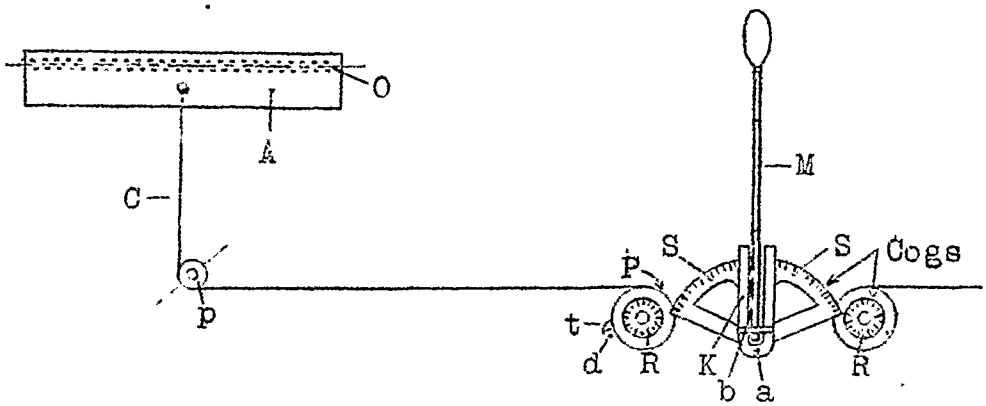

Fig. 1

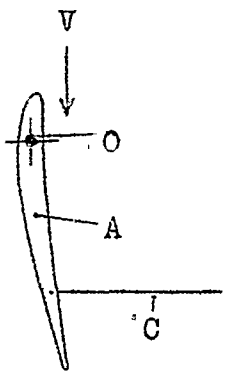

Fig. 3

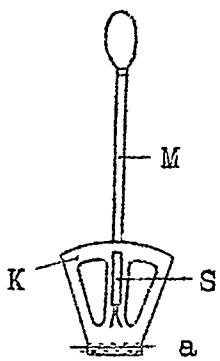

Fig. 2